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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/802,515

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Alexei Ashikhmin

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10/05/2006

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EXAMINER

BAKER, STEPHEN M

ART UNIT

PAPER NUMBER

2133

DATE MAILED: 10/05/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/802,515

Applicant(s)

ASHIKHMIN ET AL.

Examiner

Stephen M. Baker

Art Unit

2133

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 25 August 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-12 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 10-12 is/are allowed.
- 6) ☒ Claim(s) 1-8 is/are rejected.
- 7) ☒ Claim(s) 9 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 July 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Drawings***

1. The drawings are objected to because in Fig. 6, step 602, "SET OF CHECK NODES IN THE FORM OF CODES" apparently should be "SET OF CHECK NODES REPRESENTING SYMBOLS OF CODES" OR THE LIKE, by the examiner's understanding of the disclosure.
2. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

***Specification***

3. The abstract of the disclosure is objected to because:

"Each check node and each variable node is in the form of a code" appears to be elliptical or poorly worded and apparently should be "Couplings between each check node and each variable node are defined by a code" or "Each check node and each variable node corresponds to a symbol of a code" the like, as it is understood that each node corresponds to a symbol position in each codeword in the set of codewords defining the code.

Correction is required. See MPEP § 608.01(b).

4. The disclosure is objected to because of the following informalities:

In paragraph 0008, "Each check node is in the form of a code" appears to be confusing and apparently should be "Each check node corresponds to a parity symbol of the code" or the like.

In paragraph 0082, "check nodes having the form of codes" apparently should be "check nodes corresponding to symbols of codes," and "variable nodes having the form of codes" apparently should be "variable nodes corresponding to symbols of codes."

Regarding the description of the LDPC code design process shown by Fig. 6, as information flow between the nodes in a decoding process passes from check nodes to variable nodes and from variable nodes to check nodes, it's not understood how an EXIT curve is plotted for check nodes (604) without variable nodes. In step 608, a "set

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of codewords meeting code constraints” is apparently already defined, once the code is defined by a particular arrangement of check nodes and variable nodes.

Appropriate correction is required.

### ***Claim Objections***

5. Claims 1, 5 and 9 are objected to because of the following informalities:

In claims 1 and 5: “code whose variable nodes and check nodes are codes” apparently should be “code whose variable nodes and check nodes in a code graph correspond to code symbols” or the like.

In claim 9: “set of check nodes in the form of codes” apparently should be “set of check nodes corresponding to symbols of codes” or the like; “code comprising the check node” apparently should be “code comprising a symbol corresponding to the check node” or the like; “set of variable nodes in the form of codes” apparently should be “set of variable nodes corresponding to symbols of codes” or the like; and “code comprising the variable node” apparently should be “code comprising a symbol corresponding to the variable node” or the like.

Appropriate correction is required.

### ***Claim Rejections - 35 USC § 102***

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

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(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 1-8 are rejected under 35 U.S.C. 102(b) as being anticipated by the published article "On the Design of Low-Density Parity-Check Codes within 0.0045 dB of the Shannon Limit" by Chung *et al* (hereafter "Chung").

Chung discloses rate- $\frac{1}{2}$  irregular LDPC codes that come within 0.0045 dB of the Shannon limit, for correcting errors caused by transmission on a binary AWGN channel, thereby providing "a generalized low density parity check (LDPC) code whose variable nodes and check nodes are codes (sic) and which is designed to provide for successful decoding to convergence at a code rate near the capacity of a channel over which communication occurs." The code is iteratively decoded at the receiver after being transmitted by a transmitter (e.g. page 60, column 2, lines 8-11).

Regarding claims 2 and 6, as Chung's rate- $\frac{1}{2}$  code has a threshold within 0.0045 dB of the Shannon limit, it is apparently the case that "the information transfer properties of the variable nodes" closely matches "those of the check nodes."

Regarding claims 3 and 7, as Chung's code is rate- $\frac{1}{2}$  and has a threshold within 0.0045 dB of the Shannon limit, it is apparently the case that "a variable node EXIT curve" is "closely matched to and lying above a check node EXIT curve."

Regarding claims 4 and 8, as Chung's code is rate- $\frac{1}{2}$  and has a threshold within 0.0045 dB of the Shannon limit, it is apparently the case that "a relatively small area is enclosed between the variable node curve and the check node curve."

***Allowable Subject Matter***

8. Claims 9-12 are allowed.

***Conclusion***

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stephen M. Baker whose telephone number is (571) 272-3814. The examiner can normally be reached on Monday-Friday (11:00 AM - 7:30 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Albert DeCady can be reached on (571) 272-3819. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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Stephen M. Baker  
Primary Examiner  
Art Unit 2133

smb